CLAIMS

1. A magnetoresistive memory device, comprising:

a conductive core;

a first magnetic layer extending at least partially around the conductive core;

a non-magnetic material over at least a portion of the first magnetic layer and separated from the conductive core by at least the first magnetic layer; and

a second magnetic layer over the non-magnetic material and separated from the first magnetic layer by at least the non-magnetic material.

2. The device of claim 1 further comprising an antiferromagnetic layer over the second magnetic layer.

3. The device of claim 2 wherein the antiferromagnetic layer comprises one or more materials selected from the group consisting of NiCoO, MnFe, TbCo and MnNi; wherein the listed materials are described in terms of predominant elemental components rather than stoichiometry of the components.

4. The device of claim 1 further comprising:

an antiferromagnetic layer over the second magnetic layer; and

a conductive layer over the antiferromagnetic layer.

5. The device of claim 1 further comprising:

an antiferromagnetic layer over the second magnetic layer;

a diffusion barrier layer over the antiferromagnetic layer; and

a conductive layer over the diffusion barrier layer.

6. The device of claim 1 wherein the non-magnetic material comprises a dielectric material.

7. The device of claim 6 wherein the dielectric material comprises at least one of Al_2O_3 and SiO_2.

8. The device of claim 1 wherein the non-magnetic material comprises a conductive material.

9. The device of claim 8 wherein the conductive material comprises copper.

10. The device of claim 1 wherein the first magnetic layer comprises nickel and iron.

11. The device of claim 1 wherein the first magnetic layer is a ring extending entirely around the conductive core, and wherein the first magnet layer comprises a uniform composition entirely around the conductive core.

12. The device of claim 1 wherein the first magnetic layer is a ring extending entirely around the conductive core, and wherein the first magnet layer comprises a substantially constant thickness around the conductive core.

13. The device of claim 1 wherein the first magnetic layer is a ring extending entirely around the conductive core, and wherein the first magnet layer comprises a varying thickness around the conductive core.

14. The device of claim 1 wherein the first magnetic layer is a ring extending entirely around the conductive core, and wherein the first magnet layer comprises a different composition in one location than in another location.

15. The method of claim 1 wherein the first magnetic layer is a ring extending entirely around the conductive core; wherein the first magnet layer comprises a first composition which includes cobalt, chromium and niobium in one location; and a second composition which includes iron and nickel at another location; the second composition being different than the first composition.

16. The device of claim 1 wherein the conductive core comprises one or more of silver, copper and aluminum.

17. The device of claim 1 wherein the conductive core extends along a length, and further comprising:

a plurality of separated first magnetic layers spaced along said length;

a plurality of separated second magnetic layers spaced along said length; and

a plurality of spaced conductive layers over the second magnetic layers, the conductive layers extending in a direction substantially perpendicular to the length of the conductive core; the conductive layers defining wordlines of a memory array and the conductive core defining a bitline of the memory array.

18. A magnetoresistive memory device, comprising:

a conductive core comprising a length;

a plurality of spaced bit regions associated with the conductive core, the bit regions being spaced from one another by spaces along said length; the spaces between the bit regions being defined as gap regions; the individual bit regions comprising;

a magnetic ring extending around the conductive core;

a non-magnetic material over the magnetic ring; and

a magnetic layer over the magnetic ring and separated from the magnetic ring by the non-magnetic material;

the magnetic ring comprising a magnetic material, and said magnetic material extending between the spaced bit regions; and

physical changes of one or both of the magnetic material and the core in the gap regions relative to the bit regions to prevent propogation of magnetic changes in the bit regions across the gap regions.

19. The device of claim 18 wherein the physical changes comprise a difference in a curvature of an outer surface of the conductive core in the gap regions relative to the bit regions.

20. The device of claim 18 wherein the physical changes comprise a difference in a grain size of the magnetic material in the gap regions relative to the bit regions.

21. The device of claim 18 wherein the physical changes comprise a decrease in an amount of the magnetic material per unit area in the gap regions relative to the bit regions.

22. The device of claim 18 wherein:

the magnetic layers of the spaced bit line regions are over the conductive core;

the conductive core comprises an upper surface extending across the gap regions between spaced bit regions;

the conductive core upper surface extends along the bit regions; and

the physical changes comprise a decrease in an amount of the magnetic material across the upper surface within the gap regions relative to the amount of the magnetic material across the upper surface along the bit regions.

23. The device of claim 18 wherein:

the magnetic layers of the spaced bit line regions are over the conductive core;

the conductive core comprises an upper surface extending across the gap regions between spaced bit regions, and further comprises a bottom surface in opposing relation to the upper surface; additionally, the conductive core comprises sidewall surfaces extending between the upper surface and the bottom surface;

the conductive core upper surface and sidewall surfaces extend along the bit regions; and

the physical changes comprise a decrease in an amount of magnetic material across the upper surface and sidewall surfaces within the gap regions relative to the amount of the magnetic material across the upper surface and sidewall surfaces along the bit regions.

24. A method of forming a magnetoresistive memory device, comprising:

forming a trench in an insulative material;

partially filling the trench with a first magnetic material to narrow the trench;

at least partially filing the narrowed trench with a conductive material;

forming a second magnetic material over the conductive material:

forming a non-magnetic layer over the second magnetic material;

forming a third magnetic material over the non-magnetic layer;

incorporating the first and second magnetic materials, together with the conductive material, into a sense portion of the magnetoresistive memory device; and

incorporating the third magnetic material into a reference portion of the magnetoresistive memory device.

25. The method of claim 24 wherein the non-magnetic layer comprises a dielectric material.

26. The method of claim 24 wherein the non-magnetic layer comprises Al_2O_3.

27. The method of claim 24 wherein the first and second magnetic materials are identical to one another.

28. The method of claim 24 wherein the first and second magnetic materials are different from one another.

29. The method of claim 24 further comprising patterning the second magnetic material, non-magnetic layer, and third magnetic material in a common patterning step.

30. The method of claim 24 further comprising:

forming a spacer layer over the third magnetic material;

forming a fourth magnetic material over the spacer layer;

forming a protective non-magnetic material over the fourth magnetic material; and

patterning the second magnetic material, non-magnetic layer, third magnetic material, fourth magnetic material, spacer layer and protective non-magnetic material in a common patterning step.

31. The method of claim 24 wherein the trench extends in a first direction; and further comprising:

patterning the second magnetic material, non-magnetic layer, and third magnetic material in a common patterning step to form a stack; and

forming a conductive line over the stack, the conductive line extending in a direction substantially perpendicular to the first direction.

32. The method of claim 24 wherein the trench extends in a first direction; and further comprising:

first patterning the second magnetic material, non-magnetic layer, and third magnetic material in a common patterning step to form a line comprising the second magnetic material, non-magnetic layer and third magnetic material; the line extending along and over the conductive material;

second patterning the third material to form a plurality of spaced blocks over the conductive material; and

forming a plurality of spaced conductive lines over the spaced blocks, the conductive lines extending in a direction substantially perpendicular to the first direction.

33. The method of claim 32 wherein further comprising removing at least some of the second magnetic material from between the spaced blocks.

34. The method of claim 32 wherein the non-magnetic material is patterned with the third magnetic material during the second patterning.

35. The method of claim 32 wherein the first magnetic material is different than the second magnetic material.

36. The method of claim 32 wherein the first magnetic material is different than the second magnetic material; wherein the first magnetic material comprises cobalt, chromium and niobium; and wherein the second magnetic material comprises iron and nickel.

37. The method of claim 32 further comprising removing at least some of the first magnetic material from between the spaced blocks.

38. The method of claim 24 wherein the trench extends primarily in a first direction and comprises curvateous sidewalls; the method further comprising:

patterning the second magnetic material, non-magnetic layer, and third magnetic material in a common patterning step to form a line comprising the second magnetic material, non-magnetic layer and third magnetic material; the line extending along and over the conductive material;

second patterning the third material to form a plurality of spaced blocks over the conductive material; the sidewalls of the trench having a different amount of curvature in regions between the blocks than in regions beneath the blocks; and

forming a plurality of spaced conductive lines over the spaced blocks, the conductive lines extending in a direction substantially perpendicular to the first direction.

39. The method of claim 38 wherein further comprising removing at least some of the second magnetic material from between the spaced blocks.

40. The method of claim 38 wherein the non-magnetic material is patterned with the third magnetic material during the second patterning.

41. The method of claim 38 wherein the first magnetic material is different than the second magnetic material.

42. The method of claim 38 wherein the first magnetic material is different than the second magnetic material; wherein the first magnetic material comprises cobalt, chromium and niobium; and wherein the second magnetic material comprises iron and nickel.

43. The method of claim 38 further comprising removing at least some of the first magnetic material from between the spaced blocks.